CLAIMS

1. A polymetaphenylene isophthalamide-based polymer porous film with a gas permeability of 0.2-1000 ml/sec, which retains at least 60% of its gas permeability after heat treatment at 350°C for 10 minutes compared to before treatment, while also having a porous structure with a porosity of 60-80%.

2. A polymetaphenylene isophthalamide-based polymer porous film having a porous structure with a porosity of 60-80% and a cross-sectional pore laminar coefficient of 2.5 or greater, and having a specific Young's modulus of 200-800 $(kgf/mm^2)/(g/cm^3)$ in at least one direction.

3. A polymetaphenylene isophthalamide-based polymer porous film with a gas permeability of 0.2-1000 ml/sec, which retains at least 60% of its gas permeability after heat treatment at 350°C for 10 minutes compared to before treatment, while also having a porous structure with a porosity of 60-80% and a cross-sectional pore laminar coefficient of 2.5 or greater, and having a specific Young's modulus of 200-800 $(kgf/mm^2)/(g/cm^3)$ in at least one direction.

4. A porous film according to any one of claims 1 to 3, which has a thickness of 1-10 μm and is self-supporting.

5. A polymetaphenylene isophthalamide-based polymer porous film containing inorganic whiskers and having a porosity of 10-80% and a specific Young's modulus of 200-5000 $(kgf/mm^2)/(g/cm^3)$ in at least one direction.

6. A polymetaphenylene isophthalamide-based polymer porous film according to claim 5, wherein the weight ratio of the polymetaphenylene isophthalamide-based polymer to the whiskers is 50:50 to 99:1.

7. A polymetaphenylene isophthalamide-based polymer porous film according to claim 5 or 6, wherein the inorganic whiskers have a long axis dimension L of 0.1-100 μm, a short axis dimension D of 0.01-10 μm and an L/D ratio of 1.5 or greater.

8. A process for the production of a polymetaphenylene isophthalamide-based polymer porous film, comprising casting a dope prepared by dissolving a polymetaphenylene isophthalamide-based polymer in an amide-based solvent, and coagulating it in a coagulating

bath comprising an amide-based solvent containing a non-solvent for said polymer.

9. A process according to claim 8, wherein the concentration of the amide-based solvent in the coagulating bath is 30-80 wt% and the temperature is 0-98°C.

10. A process according to claim 8 or 9, wherein the non-solvent for the polymetaphenylene isophthalamide-based polymer is water.

11. A process according to claim 8, wherein the dope prepared by dissolving a polymetaphenylene isophthalamide-based polymer in an amide-based solvent contains no inorganic salts.

12. A process according to claim 8, wherein after coagulation, the porous film is rinsed with water, dried and then stretched to a factor of 1.3-5 in the uniaxial direction or to a factor of 1.3-10 in the orthogonal biaxial directions on an area scale, at a temperature of 270-340°C.

13. A process according to claim 8 wherein, after coagulation, the porous film is further stretched in a stretching bath comprising an amide-based solvent containing a non-solvent for the polymetaphenylene isophthalamide-based polymer.

14. A process according to claim 13, wherein the concentration of the amide-based solvent in the stretching bath is 5-70 wt% and the temperature is 0-98°C.

15. A process according to claim 8, wherein the coagulation is followed by immersion in a bath comprising an amide-based solvent containing a non-solvent for the polymetaphenylene isophthalamide-based polymer, with an amide-based solvent concentration of 50-80 wt% and a temperature of 50-98°C.

16. A process according to claim 15, wherein the dimethylformamide-insoluble portion of the porous film after immersion is 10% or greater.

17. A process according to claim 15 or 16, wherein after the immersion the porous film is rinsed with water,

dried and then heat treated at a temperature of 290-380°C.

18. A process according to claim 15 or 16, wherein after the immersion the porous film is rinsed with water, dried and then stretched to a factor of 1.3-5 in the uniaxial direction or to a factor of 1.3-10 in the orthogonal biaxial directions on an area scale, at a temperature of 270-380°C.

19. A process according to claim 15 or 16, wherein after the immersion the porous film is further stretched in a stretching bath comprising an amide-based solvent containing a non-solvent for the polymetaphenylene isophthalamide-based polymer.

20. A process according to claim 19 wherein, after the stretching, the porous film is rinsed with water, dried and then heat treated at a temperature of 290-380°C.

21. A process according to claim 19, wherein the concentration of the amide-based solvent in the

stretching bath is 5-70 wt% and the temperature is 0-98°C.

22. A process according to claim 8, wherein the dope used is one in which inorganic whiskers are dispersed and a polymetaphenylene isophthalamide-based polymer is dissolved in an amide-based solvent.

23. A process according to claim 22, wherein the weight ratio of the polymetaphenylene isophthalamide-based polymer to the whiskers is 50:50 to 99:1.

24. A process according to claim 22 or 23, wherein the inorganic whiskers have a long axis dimension L of 0.1-100 μm, a short axis dimension D of 0.01-10 μm and an L/D ratio of 1.5 or greater.

25. A porous film comprising at least two layers including a polymetaphenylene isophthalamide-based polymer porous layer and a heat-melting thermoplastic polymer porous layer.

26. A porous film according to claim 25, wherein the thermoplastic polymer is a polyolefin with a molecular weight of 400,000 or greater.

27. A porous film according to claim 25, wherein the thermoplastic polymer is a polyvinylidene fluoride-based polymer.

28. A porous film according to claim 27, wherein the polyvinylidene fluoride-based polymer is a copolymer composed mainly of vinylidene fluoride and a perfluoro lower alkyl vinyl ether.

29. A porous film according to any one of claims 25 to 28 wherein, at elevated temperatures, the thermoplastic polymer layer melts and plugs the pore gaps, while the polymetaphenylene isophthalamide-based polymer layer retains its shape without melting.

30. A process for the production of a porous film which comprises forming a porous layer of a polymetaphenylene isophthalamide-based polymer onto one or both sides of a porous film made of a heat-melting thermoplastic polymer, or forming a porous layer made of a heat-melting thermoplastic polymer onto one or both sides of a porous film of a polymetaphenylene isophthalamide-based polymer.

31. A battery separator comprising a porous film according to any one of claims 25 to 28.

32. A lithium ion battery employing a battery separator according to claim 31.

33. A method of using a porous film according to any one of claims 1-3 and 5-6 comprising placing said porous film as a battery separator between a positive electrode and a negative electrode in a battery.

34. A lithium ion battery comprising a battery separator situated between a positive electrode and a negative electrode, wherein said battery separator comprises a porous film according to any one of claims 1-3 and 5-6.